THE RADIO AND ELECTRONIC ENGINEER

The Journal of the Institution of Electronic and Radio Engineers

Volume 40, 1970
July–December

U. of Ill. LIBRARY
APR 22 1971
CHICAGO CIRCLE

Published by the INSTITUTION OF ELECTRONIC AND RADIO ENGINEERS
8–9 Bedford Square, London, WC1B 3RG
Telephone: 01–637 2771 (10 lines)
Telegrams: Instrad London WC1

BOUND VOLUMES OF THE JOURNAL

Limited numbers of the following bound volumes are available:—

Volume 1 (1939–40)	£2·75	Volume 21 (January-June 1961)	£3·50
Volume 2 (1940–41)	£2·75	Volume 22 (July-December 1961)	£3·50
Volume 3 (1942–43)	£2·75	Volume 23 (January-June 1962)	£3·50
Volume 4 (1944)	£2·75	Volume 24 (July-December 1962)	£3·50
Volume 5 (1945)	£2·75	Volume 25 (January-June 1963)†	£3·50
Volume 6 (1946)	£2·75	Volume 26 (July-December 1963)	£3·50
Volume 7 (1947)	£2·75	Volume 27 (January-June 1964)	£3·75
Volume 8 (1948)	£2·75	Volume 28 (July-December 1964)	£3·75
Volume 9 (1949)	£3·25	Volume 29 (January-June 1965)	£3·75
Volume 10 (1950)	£3·75	Volume 30 (July-December 1965)	£4·00
Volume 11 (1951)	£3·75	Volume 31 (January-June 1966)	£4·00
Volume 12 (1952)	£3·75	Volume 32 (July-December 1966)	£4·00
Volume 13 (1953)	*	Volume 33 (January-June 1967)	£4·00
Volume 14 (1954)	£3·75	Volume 34 (July-December 1967)	£4·00
Volume 15 (1955)	£3·75	Volume 35 (January-June 1968)	£4·00
Volume 16 (1956)	£4·00	Volume 36 (July-December 1968)	£4·00
Volume 17 (1957)	£4·50	Volume 37 (January-June 1969)	£4·00
Volume 18 (1958)	£4·50	Volume 38 (July-December 1969)	£4·00
Volume 19 (1959)	£4·50	Volume 39 (January-June 1970)	£4·50
Volume 20 (1960)	£4·50	Volume 40 (July-December 1970)	£4·50

*This volume is entirely out of print.
†In January 1963 the *Journal* was given the title *The Radio and Electronic Engineer*.

Members' own copies of the *Journal* can be bound into volumes at a cost of £1.50 per volume (postage and packaging extra: £0.37 Great Britain; £0.42 Overseas).

The appropriate *Journals* should be sent to the Publications Department, I.E.R.E., 9 Bedford Square, London, WC1B 3RG. Multiple copying without permission is illegal.

Subscription rates for the *Journal*

1 year's subscription £8·00 or $24·00
2 years' subscription £15·00 or $45·00
3 years' subscription £21·00 or $64·00
Single copies £0·75 or $2·50

Papers published in *The Radio and Electronic Engineer* are listed or abstracted as follows:

Title listings: 'British Technology Index'; 'Current Papers' (Electrical and Electronic Engineering, Physics, and Computers and Control); 'Current Contents'; 'Science Citation Index'; ASCA.

Abstracted fully: 'Science Abstracts' (Physics, Electrical and Electronics, and Computer and Control); 'Referativni Zhurnal'.

Abstracted selectively: 'Chemical Abstracts'; 'Computing Reviews'; 'Acoustics Abstracts'; 'Solid State Abstracts Journal'; 'Nuclear Science Abstracts'.

Offers of papers and short contributions for consideration for publication in *The Radio and Electronic Engineer* or for reading at meetings are welcomed and should be sent to the Institution. The general requirements for manuscripts, illustrations etc. are specified in the leaflet 'Guidance for Authors', a copy of which will be sent on request. Submission of a synopsis prior to completion of the full paper, though not essential, can save time and unnecessary effort on the part of an intending author.

DECLARATION ON FAIR COPYING

Under the terms of the Royal Society's Declaration on Fair Copying, to which the Institution subscribes, material may be copied from any issue of the *Journal* which is *out of print* and of which *no reprints are available.*

The Institution is not, as a body, responsible for expressions of opinion appearing in its publications, unless otherwise stated.

© The Institution of Electronic and Radio Engineers, 1970

PRINCIPAL CONTENTS OF VOLUME 40, 1970

JULY

A Policy for Planning Research 3

Solid-State Television Receivers—A Pattern of Second Generation Design for Monochrome and Colour P. L. MOTHERSOLE, C.Eng. 5

Colour Centres in Sodalites and their Use in Storage Displays. M. J. TAYLOR, D.Phil., D. J. MARSHALL, Ph.D., P. A. FORRESTER, Ph.D. and S. D. MCLAUGHLAN, B.Sc., M.Sc. 17

Digital Carry Applied to Successive Approximation Digital Voltmeters. J. R. PEARCE, B.Sc., C.Eng., J. BLOOMFIELD and U. QURESHI 27

The Invention of Frequency Modulation in 1902. Professor D. G. TUCKER, D.Sc., C.Eng. 33

Synthesis using Symmetric Distributed RC-Structures. Professor M. N. S. SWAMY, Ph.D., J. C. GIGUERE, Ph.D. and B. B. BHATTACHARYYA, Ph.D. 38

A Commercial Laser Interferometer for Length Measurement by Fringe Counting. B. W. BARRINGER, B.Sc. and A. J. BONNER 49

New Laser Interferometry Methods of Measuring the Velocity of High-Speed Model Missiles. H. D. VOM STEIN, Dr.Ing., P. RATEAU, L.ès Sci.Appl., G. SCHULTZE, Ing.Grad. and B. KOCH, Dr.rer.nat. 45

AUGUST

Electronic Engineering in Ocean Technology. Professor D. G. TUCKER, D.Sc., C.Eng. 57

Optimization of the Dual Ramp Voltmeter. D. WHEABLE, C.Eng. 59

Speech and Vocoders. L. C. KELLY, C.Eng. 73

Fast Pseudo-Random Number Generators for Computers. A. R. PRATT, B.Sc. 83

Optical Storage. G. G. SCARROTT, B.Sc., C.Eng. 89

An Oscilloscope Polar Coordinate Display for Multi-Dimensional Data. J. A. COEKIN, Ph.D., C.Eng. 97

Noise Considerations in the Design of Current Sources. Professor E. A. FAULKNER, Ph.D., C.Eng. and M. L. MEADE, B.Sc. 102

SEPTEMBER

Harmonized System for Quality Control 105

Adaptive Detection of Distorted Digital Signals. A. P. CLARK, Ph.D., C.Eng. 107

Transmission Factors of Microwave Filters with Prescribed Attenuation and Group Delay. B. D. RAKOVICH, Dip.Eng., Ph.D. and A. D. JOVANOVICH, Dip.Eng. 121

Standard L.F. Noise Sources using Digital Techniques and their Application to the Measurement of Noise Spectra. Professor H. SUTCLIFFE, Ph.D., C.Eng. and K. F. KNOTT, Ph.D. 132

Pulse Counting and Encoding Systems used on a Rocket-borne Spectrophotometer. D. H. BEATTIE and C. H. PATERSON, B.Sc. 137

High Accuracy Digital Linearization of Frequency Signals of Transducers. G. MAYER, Dipl.Ing., L. SIMONFAI, Dipl.Ing. and P. POTZY, Dipl.Ing. 145

A Laguerre Series Approximation to the Ideal Gaussian Filter. N. B. JONES, D.Phil. 151

OCTOBER

Laboratory Automation. G. S. EVANS, C.Eng. 157

The Estimation of Loss of Echoing Area with Very High Resolution Radars. D. C. COOPER, Ph.D., C.Eng. .. 159

Polarity Coincidence Techniques for Correlation Function Measurement and System Response Evaluation. J. A. M. MCDONNELL, Ph.D. and J. FORRESTER, M.Sc. 165

Quality Control in Capacitor Production and Testing. D. S. GIRLING, C.Eng. 173

Horizontal Aperture Equalization. A. N. THIELE, B.E. 193

NOVEMBER

Profile of a Profession 217

Problems in Bathymetric Surveying Presented by Modern Trends in Shipbuilding. Rear-Admiral G. S. RITCHIE, C.B., D.S.C. 219

Designing for Automatic Testing: The Concept and General Approach. W. R. OGDEN, C.Eng. and C. R. THOMAS 225

A Laser Machining System for Making Integrated Circuit Masks. M. S. QURESHI, Ph.D. and K. G. NICHOLS, M.Sc., C.Eng. 233

The Planning and Commissioning of a Communications Satellite Earth Station and its Integration with Existing Telecommunications Systems. N. WHEATLEY, C.Eng. 241

Plastic Film Capacitors. P. D. HABERMEL 259

Monte-Carlo Simulation of an Active Sonar. J. E. HUDSON, Ph.D. 265

A Simple Data Recording System with Computer Analysis. G. R. WHITFIELD, Ph.D. 255

DECEMBER

Improving Communication 273

Predicting Servomechanism Dynamic Performance Variation from Limited Production Test Data. P. A. PAYNE, Professor D. R. TOWILL, M.Sc., C.Eng. and K. J. BAKER, B.Eng. 275

The Use of Cathode-Ray Tubes in Professional Equipment. A. B. MCFARLANE, M.Sc.(Eng.), C.Eng. 389

Multiple Stable State Merging—A Practical Approach to the Design of Asynchronous Sequence Detectors and Similar Circuits. D. T. MARKEY, M.Tech., C.Eng. 300

A Computer Controlled Tester for Logic Networks and a Method for Synthesizing Test Patterns. K. J. CROOK, B.Sc. and Miss J. BLYTHIN, B.Sc. 309

The Visualization of Ultrasound in Solids. J. H. GUNTON, B.A. and D. M. MARSH, M.A. 316

An Ultrasonic Position Sensor for Automatic Control. W. P. WILLIS, M.E., Professor L. Kay, Ph.D., C.Eng. .. 305

A Cellular 8421 B.C.D. Multiplier. G. WHITE, B.Sc. 321

Measurements on a Solid-state Noise Source. J. A. ROBERTS, M.Sc. and Professor W. GOSLING, B.Sc., C.Eng. 323

Subject Index 325

Index of Persons 327